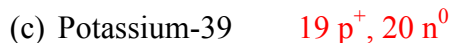


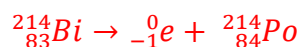
Types of Radioactive Decay & Nuclear Stability

1) Indicate the number of protons and neutrons in the following nuclei:

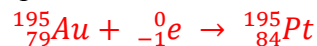


2) Write the balanced nuclear equation for the following processes:

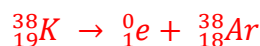
(a) Bismuth-214 undergoes beta production



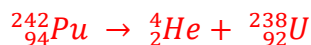
(b) Gold-195 undergoes electron capture



(c) Potassium-38 undergoes positron emission

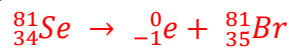


(d) Plutonium-242 emits alpha particles

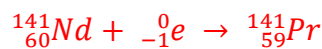


~~(e) Gold-201 decays to a mercury isotope~~

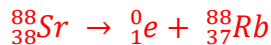
(f) Selenium-81 undergoes beta production



(g) Neodymium-141 undergoes electron capture

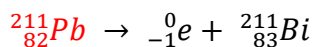


(h) Strontium-88 decays by positron emission

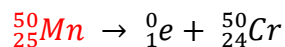


3) Decay of which nucleus will lead to the following product:

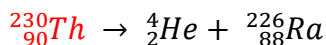
(a) Bismuth-211 by beta decay



(b) Chromium-50 by positron emission

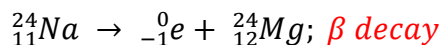


(c) Radium-226 by alpha decay

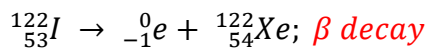


4) What particle is produced during the following decay processes:

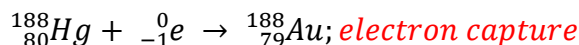
(a) Sodium-24 decays to magnesium-24



(b) Iodine-122 decays to xenon-122



(c) Mercury-188 decays gold-188



5) Predict the type of radioactive decay process for the following radionuclides:

(a) ${}^8_5\text{B}$ 5 p⁺, 3 n⁰; positron emission or electron capture

(b) ${}^{68}_{29}\text{Cu}$ 29 p⁺, 39 n⁰; positron emission or electron capture

(c) Neptunium-241 93 p⁺, 148 n⁰; alpha decay

(d) Chlorine-39 17 p⁺, 22 n⁰; beta decay

6) One of the nuclides in each of the following pairs is radioactive. Predict which is radioactive and which is stable and explain:

(a) ${}^{39}_{19}\text{K}$ and ${}^{40}_{19}\text{K}$

Potassium-39: 19 p⁺, 20 n⁰ (radioactive, outside the belt of stability)

Potassium-40: 19 p⁺, 21 n⁰ (stable, inside the belt of stability)

(b) Magnesium-25 and neon-24

Magnesium-25: 12 p⁺, 13 n⁰ (stable, inside the belt of stability)

Neon-24: 10 p⁺, 14 n⁰ (radioactive, outside the belt of stability)

7)

8) Which of the following nuclides have magic numbers of both protons and neutrons:

(a) Helium-4 2 p⁺, 2 n⁰

(b) Carbon-12 6 p⁺, 6 n⁰

(c) Calcium-40 20 p⁺, 20 n⁰

(d) Nickel-58 28 p⁺, 30 n⁰

(e) Lead-208 82 p⁺, 126 n⁰